

CLAIMS

1. A carrier tray apparatus for holding a plurality of component trays, each of the plurality of component trays having a plurality of component pockets for holding a component, the carrier tray apparatus comprising:

a carrier tray for carrying the plurality of component trays on a single plane, the carrier tray including a component tray captivating structure that secures each of the plurality of component trays in three dimensions, the component tray captivating structure including:

a channel structure providing a channel, the channel structure adapted to provide for insertion of each of the plurality of component trays therein and providing for positioning the component trays with substantially no spacing between component trays; and

a top opening adapted to provide access to semiconductor devices disposed within the plurality of component pockets when the component trays are inserted in the channel.

2. An apparatus as recited in claim 1 wherein the channel includes an opening for insertion of the component trays, and the channel structure having a plurality of sides that restrict lateral tray movement of the component tray, and wherein the captivating structure further includes:

a bottom tray support that supports a bottom of the component trays to prevent downward movement of the component trays relative to the carrier tray; and

upward tray restraining structure that restricts upward movement of the component trays relative to the carrier.

3. An apparatus as recited in claim 2 wherein the captivating structure further includes longitudinal tray restraining structure that prevents the plurality of component trays from horizontal movement out of the channel.

4. An apparatus as recited in claim 3 wherein the longitudinal restraining structure forces each the component tray into contact with an adjacent component tray.

5. An apparatus as recited in claim 4 wherein the component trays are serially positioned relative to one another, and the longitudinal restraining structure includes:

an end stop at a distal end of the channel; and
a horizontal urging structure at a proximal end of the channel.

6. An apparatus as recited in claim 2 wherein the upward tray restraining structure includes:

a first side rail on a first side of the channel extending over the channel so as to be over a first side of the component trays in the channel; and
a second side rail on an opposite side of the channel from the first side, and extending over the channel so as to be over a second side of the component trays.

7. An apparatus as recited in claim 2 wherein the upward tray restraining structure includes:

a first plurality of protrusions extending over the channel from a first side of the channel; and
a second plurality of protrusions extending over the channel from a second side of the channel.

8. An apparatus as recited in claim 2 wherein the bottom tray support includes a single flat surface.

9. An apparatus as recited in claim 2 wherein the bottom tray support includes a plurality of rails.

10. A carrier tray and component tray combination apparatus for holding components, the apparatus comprising:

a plurality of component trays, each of the plurality of component trays having a plurality of component pockets, each for holding one of the components; and

a carrier tray for holding the plurality of component trays, the carrier tray including a component tray captivating structure that secures the plurality of component trays in three dimensions, the captivating structure including:

a channel structure providing a channel and adapted to provide for insertion of each of the plurality of trays in the channel, and the channel structure having a top opening adapted to provide access to semiconductor devices disposed within the plurality of component pockets when the component trays are inserted in the channel.

11. An apparatus as recited in claim 10 wherein each of the plurality of component trays includes:

a two-dimensional linear array of component pockets, including a first row of pockets and a last row of pockets;

a distal end portion of the component tray extending a first distance from a center of the first row of pockets to a distal edge of the component tray;

a proximal end portion of the component tray extending a second distance from a center of the last row of pockets to a proximal edge of the component tray; and

wherein the first and second distances are each an integer multiple of half of a distance between centers of adjacent rows of the pockets.

12. An apparatus as recited in claim 10 wherein the channel structure includes an opening to the channel for component tray insertion and a plurality of sides that restrict component tray movement in a lateral direction in the channel, and wherein the captivating structure further includes:

a bottom support that supports the component trays to prevent downward movement of the component trays relative to the carrier tray;

lateral support structure for restraining lateral movement of component trays in the channel; and

upward restraining structure that restricts upward movement of the component trays in the channel relative to the carrier tray.

13. An apparatus as recited in claim 12 wherein the captivating structure further includes longitudinal retaining structure that prevents the component trays from movement out of the channel.

14. An apparatus as recited in claim 13 wherein the longitudinal retaining structure includes a clip for forcing each of the component trays into contact with another component tray.

15. An apparatus as recited in claim 14 wherein the longitudinal retaining structure further includes:

an end stop at a distal end of the channel.

16. An apparatus as recited in claim 12 wherein the tray upward restraining structure includes:

a first side rail on a first side of the channel extending over the channel so as to be over a first side of the component trays in the channel; and

a second side rail on an opposite side of the channel from the first side, and extending over the channel so as to be over a second side of the component trays.

17. An apparatus as recited in claim 12 wherein the upward restraining structure includes:

a first plurality of protrusions extending over the channel from a first side of the channel; and

a second plurality of protrusions extending over the channel from a second side of the channel.

18. An apparatus as recited in claim 12 wherein the bottom tray support structure includes a single flat surface.

19. An apparatus as recited in claim 12 wherein the bottom tray support structure includes a plurality of rails.

20. An apparatus as recited in claim 12 wherein the components are one of semiconductor devices and semiconductor integrated circuits.

21. A component tray and carrier tray combination for holding components, comprising:
a plurality of component trays, each the plurality of component trays having a plurality of component pockets for holding devices, and wherein each of the plurality of component trays includes:

- a two-dimensional linear array of component pockets, including a first row of pockets and a last row of pockets;

- a distal end of the component tray extending a first distance from a center of the first row of pockets to a distal edge of the component tray; and

- a proximal end portion of the component tray extending a second distance from a center of the last row of pockets to a proximal edge of the component tray; wherein the first and second distances are each an integer multiple of half of a distance between centers of adjacent rows of the pockets;

- a carrier tray for holding the plurality of component trays, the carrier tray including:

- a channel structure providing a channel and adapted to provide for insertion of each of the plurality of trays in the channel, the channel structure including a bottom surface for supporting the component trays in a downward direction, and two opposing side walls for restraining the component trays in a direction transverse to a length of the channel, and an end wall at a distal end of the channel for restraining the component trays;

- side tabs extending from the side walls over the channel for restraining movement of the component trays in an upward direction;

- an end tab extending from the end wall over the channel for restraining movement of a first inserted one of the component trays in an upward direction; and

- a resilient retainer for restraining upward movement of a last inserted one of the component trays, and for applying a force on a first the inserted component tray in

a direction longitudinal to a length of the channel and thereby urging the component trays towards the distal end.